

Introduction

Reconfiguring Global Rhetorics of Science

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Is there an equivalent in traditional knowledge to what science calls a theory? Absolutely. But it's a different kind of theory, one that centers on the idea of responsibilities. All bees, for example, have a responsibility to pollinate. The Indigenous observer is asking the bee, How are you living out your responsibility? And what about you, flower?

—Robin Wall Kimmerer¹

We cannot solve our problems with the same level of thinking that created them.

—apocryphal, attributed to Albert Einstein

A story told in *Desert Lake: Art, Science, and Stories from Paruku* explains the purpose of this volume better than I can. *Desert Lake* recounts a joint scientific-artistic project involving the Walmajarri, traditional custodians of Paruku (Lake Gregory) in Western Australia. The Paruku Project began when the Walmajarri asked for assistance in controlling a fish parasite, as well as in assessing several archaeological sites, including one that helped pushed back current knowledge of the presence of humans in Australia to around 50,000 BCE. For their part, the collaborating Euro-American scientists² received unprecedented access to these sites and new data on

Aboriginal ecological management practices. The project was not without its complications, however, among these an incident in which custodians brought archaeologists to examine some bones that had been unearthed by rains. Community lore framed these as the remains of a murder or ancient conflict. But the archaeologists quickly identified a proffered tooth as nonhuman, likely from a horse. Notwithstanding, one custodian held up the tooth before the community and declared it human. The archaeologists strove to correct the record, speaking over the custodian, at which point an elder put her hand on one of the scientists' arms gently and said, "You're not listening." The archaeologists subsided, leaving the tooth to hover in collective awareness in superposition—both horse and human.³

It was both an emblematic and a pivotal moment for the Paruku Project: emblematic in that it epitomized the many, many incommensurabilities between globalized Euro-American and Indigenous knowledge-ways that had doomed previous attempts at collaboration with the Walmajarri;⁴ pivotal in that the Project was able to move past it by layering rather than reducing. Instead of insisting that the human tooth be replaced by the horse tooth in viewers' minds—in other words, instead of insisting that Indigenous ways of knowing and representing the world must either agree with or be reduced to Euro-American ways—the project's organizers chose instead to let both interpretations stand, equally true and valuable, each meeting a particular need for the people who called it forth. The organizers accomplished this layering via several techniques, chief among them the literal layering of acrylic paints over topographic maps of key sites, like the tooth dig site, to create paintings of Country (land/history/culture). The ultimate success of the project graphically made the point that global risks—including climate change, pandemics, and food and energy security—cannot be collectively and effectively managed if we continue to insist that all global systems for knowing and representing natural phenomena be reducible to the Euro-American scientific system. That is a point the present volume takes both very seriously and as a starting point from which to search for new ways to integrate global sciences in the just and collective management of global risks.

Most of the content of this starting point—the part about the equality of human systems of natural knowledge and the effacement of that equality by colonial dynamics—is old news, established amply by scholarship in science and technology studies (STS) and the history of science over the last fifty years. While a review of this work is beyond the scope of this introduction (though interested readers will find a list of key texts in

the notes), it has thoroughly dispelled the myth of science and scientific methods as Euro-American inventions.⁵ This scholarship has convincingly demonstrated the dependence of Euro-American science on colonization as well as its emergence from older global traditions, most notably the Islamic sciences, from which Euro-American science took (and took credit for) foundational concepts and theories in mathematics, astronomy, geography, chemistry, and medicine. That old saying about the only difference between a dialect and a language being that the latter has an army and a navy applies equally to the difference between “science” or “medicine” on the one hand and “ethnoscience” and “alternative medicine” on the other: in other words, the dominance of Euro-American science today in the world is more the result of colonial geopolitics than of any difference in quality among global sciences, or any process of systematic verification.

The need for collective management of global risks across traditional boundaries and borders is a relatively new concern, however. Evidence is mounting that top-down, neoliberal approaches to managing these risks produce significantly negative consequences for vulnerable communities, particularly in the Global South.⁶ What is needed instead are risk collectives that can nimbly integrate global and local information to manage global risks equitably for these communities.⁷

The good news here is that the collective management of risk and uncertainty has been the business of rhetoric for the last 2,500 years in the Euro-American tradition and much longer in other global traditions of communication like the Aboriginal practices of Country and Law. Furthermore, the move to reduce all global sciences to Euro-American science is a rhetorical move, an act of synecdoche in which a part of a system is made to stand in for the whole. Accordingly, we are organizing this volume around rhetorical tactics for moving away from synecdoche and into other ways of configuring the relationship of Euro-American science to its fellow sciences around the globe. In other words, if the problem is that we’ve been treating Euro-American science as a synecdoche for all global sciences, then we can start to reinvent that relationship by studying cases of subversion and resistance to the hegemony of Euro-American science (irony); imagining new rhetorics of science by taking inspiration from non-Euro-American ones (metaphor); and writing narratives about the world that collect and associate rather than reduce and analyze (metonymy). While this reconfiguration is admittedly a very limited decolonization of the rhetoric of science (ROS), it has the advantage of working within our existing toolkit to start shifting the discourse.

While the authors in this volume will name and describe the global communication traditions in which they are working, it is my task to provide a brief orientation to ROS. In the spirit of the volume, I wish to view this history with a somewhat wider aperture than is customary, taking in the coevolution of ROS with Islamic rhetoric and science—in acknowledgment of the heavy debt that the Euro-American traditions owe in this regard.⁸

In the Euro-American tradition, rhetoric was invented by a collective of Attic Greek tribes in the 6th century BCE as a social technology used to get the collective to act together for the purposes of managing the uncertainties they jointly faced—both environmental and social. It was officially organized and codified as *techne*, a technology or productive art, in the 4th century BCE by the Socratics, Aristotle chief among them. He famously defined rhetoric as “an ability, in each particular case, to see the available means of persuasion.”⁹ It was during this period that the first serious contact and hybridization between Greco-Roman and Arabic traditions occurred, as the library at Alexandria became an important node for intercultural exchange of scholarship and art. Greek science became influenced by the classical Babylonian sciences—particularly astronomy, agronomy, and medicine—developed by eastern Sassanid (Iranian/Persian) and Hindu scholars and syncretized by the Arabic scholars working at Alexandria. At the same time, these scholars translated and studied Greco-Roman rhetorical and scientific theories and integrated them with their own.

Meanwhile, in Rome, the art of rhetoric was being developed and fine-tuned by senators and educators such as Cicero and Quintilian. As empire gradually eroded democracy, however, rhetoric’s roots in the collective management of risk also withered, and the art became transplanted largely into scholastic grounds, where it survived through the political chaos of the Middle Ages, cloistered in monasteries and universities. During this same time frame, scholarship in the sciences and communicative arts was actively advancing under the Umayyad (661–750 CE) and Abbasid (750–1258 CE) caliphates. A key factor in the explosion of Islamic learning during this Golden Age was a view of Allah as a creator who not only permitted but actively promoted the investigation of his creation as a form of devotion.¹⁰ This principle enabled an interlinkage of religious, artistic, and scientific activity that caused science to flourish in Islam, while Aristotle’s texts were quarantined in Byzantine treasuries as dangerous pagan heresy.¹¹ It was through the raiding of these treasuries in the Crusades, alongside other territorial skirmishes throughout the

Mediterranean, that the second great rapprochement of European and Islamic traditions came about.

Historians of science used to restrict the contributions of Islamic scholars to the development of European science to the mere safekeeping and translation of Greco-Roman scientific texts during Europe's dark ages, with grudging allowances made for the innovations of algebra and alchemical experimentation. However, this story has been revised over the last forty years as science historians began to read Arabic texts in the original, and as historians of Islam became interested in the origins and dissemination of scientific knowledge. We now know that the books that Thomas Aquinas and other European scholars gleaned from the bloodstained conflicts in the Levant were not mere translations of Greek and Roman scholarship but significant innovations on it—many of which the Europeans simply assimilated without crediting the innovators. For instance, William Harvey's theory of blood circulation was anticipated by Ibn an-Nafis's four centuries earlier; the revision of planetary motion attributed to Copernicus was substantially worked out by Ibn al-Shātir in the 14th century; and systems of geographic projection worked out by Arab geographers in the 9th to 12th centuries enabled a quantum leap forward in European mapmaking and navigation in the 16th century.¹² While work is ongoing to prove direct lines of influence in some of these cases, we do know that original texts by Islamic scientists were circulating in Europe well in advance of the Renaissance and almost certainly played a significant role in its emergence.¹³ The Islamic tradition emphasized the practical and political applications of scientific knowledge well before this focus emerged in 17th-century Europe.¹⁴

After this second period of cross-fertilization, geopolitical circumstances on both sides—namely, imperial colonialism in Europe and the conservatism of the Ottoman Empire—effectively cut off collaboration between the respective scholarly communities. This development made it hard to challenge the growing myth of an autochthonous European science, and eventually that myth became dominant, acknowledging Euro-American science as the only valid science. However, in the last fifty years, as a result of globalization and a new wave of geopolitical conflicts in the Middle East, we have experienced a third engagement of Islamic and Euro-American knowledge systems that has helped challenge the Euro-American hegemony.

As Islamic nations around the world have gained population, wealth, and political clout, some of their scholars have called for a return to an

Indigenous Islamic science, under the heading of Islamization of Knowledge (IOK), as a means of decolonizing their societies. Turkey recently banned the teaching of evolution in public schools,¹⁵ and Islamic schools teaching IOK-based curricula are proliferating in Malaysia, South Africa, and Europe, among other places.¹⁶ Scholars studying the IOK movement are deeply divided over its politics: some see in it the promises of innovation, autonomy, and cultural healing, while others fear that only balkanization and fundamentalism will result.¹⁷ But the IOK debate stands as the first major attempt to engage questions very similar to those engaged by this volume, and to recognize these questions as not merely ones of knowing the world, but making it: How do we move past the neocolonial era into a more equitable global cooperation in technoscience and politics? What will this new era look like? The Islamic principle of the divine unity of all human endeavor is one source of the promise that scholars such as Osman Bakar locate in Islamic sciences—to point a path forward out of our global risk crises.¹⁸

A related move toward the unification of world-building (science) and community-building (rhetoric) has occurred in rhetorical studies over this same epoch. Though reduced on the European continent to the study of stylistics by the 19th century, the preaching tradition in England kept Classical principles of oratory alive and functioning there; with the advent of the Belles Lettres era, rhetorical techniques began to be used not just as heuristics for the creation of persuasive texts, but also as hermeneutics for their interpretation. This is the tradition that became regularized as current traditional pedagogy in land-grant universities in the United States, which had a mission to educate all post-secondary students up to an acceptable professional standard of reading and writing.

After World War II, the neocolonial globalization of Euro-American capitalist democracy—and its attendant risks—prompted a rebirth of rhetoric not just as composition pedagogy but as social *techné*. Scholars such as Kenneth Burke, Chaim Perelman, and Lucie Olbrechts-Tyteca returned the focus of the art to collective deliberation;¹⁹ meanwhile, sociologists such as Ulrich Beck were using terms like *world risk* to describe the new exigence for collective action in late capitalism.²⁰ In 1982, Thomas Goodnight coined a new definition of rhetoric for the era: “The creative resolution and resolute creation of uncertainty.”²¹ Since that time, scholars of rhetoric have turned to excavating the ancient roots of rhetoric in collective risk management, focusing in particular on the rhizomatic action of rhetoric as a middle ground between critical paralysis on the one hand, the total-

izing solutions to risk management on the other,²² and the circulation of nonsymbolic material and energy in the flow of communication.²³

This excavation effort naturally led some rhetoricians outside the boundaries of the Greco-Roman tradition to look for alternatives to its agonistic, imperialist tendencies. This new field of comparative rhetoric (originally contrastive rhetoric) was reflexive from the beginning, pointing out the dangers of hunting for Euro-American concepts in non-Euro-American settings even as it sought an ethical footing from which to conduct crucial discovery and recovery work.²⁴

This debate was soon echoed in decolonial studies of rhetoric, which have over the course of the last decade aimed not only at criticizing the hegemony of Euro-American rhetorics in the “contact zones” (primarily American ones) generated by colonial imperialism, but also at counteracting and even undoing imperialism’s effects.²⁵ For example, in her study of Sarah Winnemucca and Charles Alexander Eastman’s oratorical practices, Malea Powell cautions against the merely “additive” approach to decolonizing rhetoric by expanding the canon, arguing that this still centers and privileges Euro-American rhetoric.²⁶ Along these same lines, Ellen Cushman has argued that, in a truly decolonial framework for rhetorical education, the dominance of the Euro-American tradition—particularly, the English language’s “place as a lingua franca”—must be “questioned, equalized, and replaced with a more cosmopolitan understanding of English’s place alongside and equal to a pluriversity of languages.”²⁷ But in order to accomplish this decentering, the “discipline’s tendency to prioritize so-called objective approaches to knowledge and Euro-American narratives of rhetorical practice” must first be challenged, according to Lisa King and the editors of *Survivance, Sovereignty, and Story: Teaching American Indian Rhetorics*.²⁸ The pivotal role of objectivity in the dominance of Euro-American disciplinary traditions is the point at which ROS must become involved in the decolonization project.

Unfortunately, ROS has lagged behind in comparative and decolonial work. ROS began in the 1970s and 1980s by studying how Euro-American scientists used words—in addition to equations and experiments—to persuade members of their own professional communities to accept their claims about the natural world. With the critical turn in the 1990s, ROS widened its view to consider the interaction of scientific communities with the societies supporting them.²⁹ Since then, the field has made great strides in diversifying “rhetoric” into “rhetorics,” considering the impact of economic class, race, gender, disability, and nonhumans on the way science

is done and communicated.³⁰ But rhetoric's partner term, "science," has remained stubbornly monolithic—so much so that, to this day, if readers in STS restricted themselves only to ROS scholarship they would never know other global sciences existed. Meanwhile, as noted above, historians, philosophers, and sociologists of science have been investigating global sciences for 200 years, intensively so for the last 50.³¹ Even in ROS's sister field of technical and professional communication (TPC), scholars have made much more progress in decolonizing the discipline, for instance, by recuperating the professional contributions of people of color to science and technology,³² critiquing the colonial agency of TPC in vulnerable communities,³³ revising fieldwork methodologies for studies in post- and neocolonial settings,³⁴ and decolonizing TPC pedagogy.³⁵

There are several reasons for ROS's failure to interrogate the dominance of Euro-American science, such as a laudable preoccupation with watchdogging its abuses in vulnerable populations, as well as an understandable reluctance to jeopardize collaborations with scientists by appearing "anti-science." There is also, perhaps, a less-admirable obsession with the core Euro-American canon of STS, born out of a desire to gain admittance to the club, so to speak. But the reasons hardly matter at this point. What matters is what has always mattered to rhetoric: *now*. And *now*, science—more accurately, the "triple helix" of state, corporate, and university actors that together constitute the sociopolitical agency of Euro-American science³⁶—has materially participated in bringing about the global environmental crises we face; *now*, our colleagues in STS and history of science are decades ahead of us in decolonizing scientific practice. It is well past time for rhetoricians to join the fray—particularly because what is needed right *now* is expertise in deliberating across differences to collectively manage global risk, and that is our wheelhouse.

Not only will a shift from "rhetorics of science" to "global rhetorics of science" generate new, useful strategies for collective risk management, it will also give ROS a mirror in which it may reflect on its own practices, including its continued privileging of Euro-American rhetorics. And it will hopefully contribute to a rapprochement between Euro-American and global lifeways at a time when mutual balkanization and fundamentalism are creating situations like the current one in Turkey or the recent one in the United States, in which the president hamstringed his own Environmental Protection Agency and repeatedly and publicly denied the reality of global climate change.³⁷

In sum, rhetoricians not only have much to gain from studying global rhetorics of science; we also stand to lose a great deal if we continue

to give our tacit support to the imperialism of Euro-American science, particularly when it fits hand in glove with neoliberal, transnational interventions in the lives of Black women in the United States, coastal fisherman in Indonesia, and farmers in Nicaragua.³⁸ If as rhetoricians we remain committed to democracy and justice, it stands to reason we should be helping to reinvent these neocolonial dynamics.

But how to begin? Certainly, one volume cannot and should not hope to achieve the decolonization of ROS. Accordingly, as editor, I set a modest goal for our project: to use what was already in our toolkit as rhetoricians to take a step outside our Euro-American nursery—both to look back at it and to look outward, to *reconfigure* the relationship between Euro-American science and global sciences. I have structured this reconfiguration using the four most common or dominant rhetorical figures, formerly referred to as “master tropes”: synecdoche, irony, metaphor, and metonymy. Historian Hayden White has argued persuasively that these tropes frame the majority of modern histories,³⁹ so they seemed like a good starting place for resetting Euro-American science in its proper context as one among many global sciences. Plus, I relished the idea of *turning* (troping) this colonial frame of “master” tropes back on itself in a decolonial project. Troping, as a mainstay of colonial rhetorics, has also served as a key site for decolonial intervention.⁴⁰ And so it will serve in the present volume.

In what follows I will briefly define the four dominant tropes with examples and explain how they frame the contributions to this volume before concluding this introduction.

Synecdoche: Reducing a Complex Whole to One Part

Synecdoche is a rhetorical figure of reduction. It treats a complex idea by way of one part that is easier to grasp and manipulate.⁴¹ So, for instance, in the United States, we say “Washington is in chaos” when concerned about overall disarray in our federal government, or we use the synecdoche “main street” to encapsulate the attitudes of millions of Americans who live in small cities and towns. President Obama was an expert in synecdoche, framing his speeches around the lived experience of this grandmother or that teenager, their individual life expressly chosen to stand in for the lives of their wider communities, perhaps even the entire nation.

Because it serves to reduce massive, complex situations to small ones that are easier to comprehend and control, synecdoche confers a great

deal of rhetorical power on its user. Unsurprisingly, then, synecdoche has played a central role in the global dominance of Euro-American science, as this singular scientific tradition came to stand in for *all* global scientific traditions in education, health care, and environmental policy-making. Now, if Native American children want to become scientists, they must be inducted into a scientific tradition born an ocean away from their homeland and, in the process, repress or reject much of their own Indigenous knowledge of their world.⁴² By the same token, when autochthonous accounts of natural phenomena conflict with the globalized Euro-American account, they must be rejected or reduced to fit. This Procrustean reconciliation happens constantly, but some recent examples include the tragic governmental dismissal of local warnings against the L'Aquila earthquake in Italy;⁴³ the destruction of traditionally managed mangrove lagoons to build costly, ineffective, and unsustainable seawalls in Indonesia;⁴⁴ and the decades-long refusal by the United States Food and Drug Administration (USFDA) to approve drugs to treat fibromyalgia since it was considered a hysterical condition existing only in “crazy” women’s heads.⁴⁵

Naturally, these kinds of rhetorical reductions would never have succeeded if they had not been wedded to a major geopolitical reduction—namely, neoliberal capitalistic globalization. Accordingly, Kelly Happe dedicates the first chapter of this volume, “How Euro-American Science Became Dominant: Transnational Circulations of Knowledge and Capital” to tracing the history of this geopolitical reduction, using reproductive technologies as a case study to illustrate how something as rooted, local, and individual as a human ovum came to be the globalized object of Euro-American scientific definition, control, and capitalization. The chapter describes and unpacks the ways in which capitalist logics inform the “the capitalization of life” and the “co-production” of science and market logics when ova become a kind of speculative biocapital. Happe finishes by looking forward—suggesting ways to reconfigure the synecdochal reduction of life and thereby decapitalize it.

Irony: Exposing Diversity in Apparent Unity

Most readers are probably familiar with irony from their high-school lessons about one particular species of it—dramatic irony, in which the assumptions of the protagonists are shown to be unfounded by developments that reverse them. But rhetorical irony is a more general and capacious

figure that reveals discontinuity and dissensus in situations assumed to be continuous and consensual.⁴⁶ So, when Mark Antony repeats “Brutus is an honorable man” in his funeral oration, he uses that phrase as an ironic lever to pry open the consensus on Brutus’s honor. Satire unsurprisingly trades heavily in irony, as did Jonathan Swift’s “Modest Proposal” in the 18th century that the English should simply eat excess Irish children to control their population and spare them the torments of poverty.⁴⁷

As is clear in the Swift example, irony is also the organizing trope of critique. And in reconfiguring the relationship between Euro-American science and other global sciences, critique is an important first step—to render visible currently invisible hegemonic colonial (or neocolonial) power dynamics. Three of our chapters contribute to the decolonization of ROS by critiquing the rhetorical and political power wielded by Euro-American science in global—particularly colonial—contexts. In chapter 2, “The Shifting Rhetoric of Environmental Science in Australia: Acknowledging First Nations People and Country,” Emilie Ens and her colleagues in the Cross-Cultural Ecology and Environmental Management Lab at Macquarie University consider the current interaction of Indigenous and Euro-American ecological sciences in Australia. As mentioned at the outset of this introduction, Indigenous Australians have intricately managed their traditional estates since time immemorial. However, with the onset of European colonization, Indigenous knowledge systems were ignored, suppressed, or exploited to support settler agendas (i.e., to survive an environment that was harsh and unfamiliar to European colonists). Notwithstanding, as the mainstream discourse around race, social justice, and inclusion continues to evolve, so too does the rhetoric of science in Australia, which is shifting to one more inclusive of Indigenous science and knowledge. Ironically, as Euro-American ecologists now struggle to cope with climate change in their own countries, they are increasingly turning to Australian Aboriginal custodians as experts in climate adaptation. This chapter finishes by pointing to new cross-cultural approaches that seem to be working to open up space for more globally inclusive scientific methodologies and epistemologies.

In chapter 3, “African Sciences and Indigenous Knowledge Systems in the West African Ebola Crisis,” Toluwani Oloke and Olusegun Soetan analyze the problems that Euro-American medical practitioners and agencies encountered in trying to get West Africans to adopt their treatment regimes. West Africans preferred to seek treatment from traditional healers, and Ebola fatality and recovery statistics were vastly underreported as a

result. Based on their personal experience working in this crisis, and in the Yoruba culture, the authors conclude that the difficulties in coordinating Ebola efforts lay in the rhetorical failures of Euro-Americans to recognize scientific literacies among the Yoruba and other people, and to appreciate the distribution of African sciences throughout traditional religious, social, and mythical/sociolinguistic paradigms. The authors describe the African sciences and Indigenous knowledge systems among the Yoruba and explain how these belief systems influence the relationships and responses of Africans to health interventions in global health pandemics and epidemics. The authors conclude that a people's long-held cultural beliefs and practices cannot be alienated from that people during a crisis; in fact, the crisis in Nigeria served indirectly to promote and legitimate traditional African medicines as solutions to antibiotic resistance and other limitations of Euro-American medicine.

By contrast, in chapter 4, "A Critical Contextualized Approach to Studying Clashing Risk Cultures: Mapping the Transcultural Environmental Risk Communication of PM2.5 in China," Huiling Ding and Jianfen Chen treat a case in which Euro-American scientific standards were ironically recruited by local activists to combat Chinese technocracy. Identified as the culprit of smog plaguing many Chinese cities in winter, Particulate Matter (PM) 2.5 has become a household term since 2011 due to the nationwide debate on China's air quality standard. This chapter investigates the grassroots, networked risk communication and citizen-science endeavors around PM2.5 in China and the rhetorical effects of such arguments on China's air policies through the lenses of actor network theory and transcultural risk communication. The analysis reveals that the policy consensus on PM2.5 was achieved via an *ad hoc* collaborative intervention initiated by one environmental non-governmental organization (ENGO) on social media. The chapter concludes with a discussion of strategies for adding cultural nuance to cross-media analysis in transnational technical communication contexts in order to capture dynamics that run counter to established Euro-American communication norms.

Metaphor: Comparison as an Engine of Reinvention

Literal volumes have been written about the role of metaphor in scientific practice.⁴⁸ From them we have learned that scientific models are in essence elaborated metaphors, that scientists rely on metaphor to move

from domains they understand to unknown domains, and that the choice of metaphor in science communication can profoundly impact the public understanding of science. As it does in poetry, metaphor serves scientific inquiry by suggesting new comparisons between the known and the unknown, new ways to see, know, and talk about the world. This is perhaps the most powerful way in which global sciences are currently influencing the practice of Euro-American sciences—by suggesting alternative theories and practices, particularly in vulnerable communities and in the Global South, which is increasingly the battleground of climate change. In chapter 5, “Where Voyaging Ends: Social Cosmology on Rapa Nui,” Francisco Nahoe suggests that Euro-American rhetorics of science can be helpfully challenged and expanded by considering the case of the famous *moai* of Rapa Nui (Easter Island). These monumental statues have long presented a challenge to Euro-American archaeology. Nahoe, a Rapa Nui citizen and descendant of a prominent archaeologist working on the island, proposes a novel interpretation of the *moai* as a “quasi-discourse,” a configuration that simultaneously constructed physical and social cosmologies on the island. The building of the *moai* appears to have coincided with the end of long-range navigational culture of on Rapa Nui and is thus best read, according to Nahoe, as a continuation of Polynesian ethnoastronomy. He argues that *moai* production both conserved the ethnoastronomy of navigation and channeled it into another social project: maintaining Polynesian social identity and cosmology in the absence of being able to voyage to connect with other Polynesian people groups. Nahoe concludes that appreciating rhetoric as social cosmology expands the capacity of ROS to work with global sciences that transmit knowledge in ways that exceed traditional Euro-American discursive norms.

In chapter 6, “Celtic Geometric Art as a Visual Rhetoric of Science,” Evelyn Dsouza investigates the inventive potential of mathematical concepts developed, and overlooked, in the shadow of Anglo-American mathematics. A recent breakthrough polymerization technique in Euro-American chemistry was inspired by Celtic knots, complete loops without a beginning or end that have adorned religious monuments and manuscripts since the time of the late Roman Empire. By delving into their history, Dsouza learns that Celtic knotwork reveals the deep mathematical sophistication of their creators, an Indigenous knowledge suppressed by the colonization of Ireland and its racist policies. By way of rhetorical sequencing, an analytical technique in historical research, this chapter recovers a Celtic rhetoric of mathematics and ecology as made manifest in the mathematical and artistic

figuration of the knot. The chapter first attempts to understand Celtic knots on their own terms, as figuring the nexus between nature and culture, and then examines their uptake in current scientific and mathematical thought—imagining them as an alternative to traditional figurations in Anglo-American rhetorics of science, one that may be perfectly poised to advance complexity science and ecology. These chapters invert Eve Tuck and K. Wayne Yang’s critique of decolonization as a metaphor in order to examine the actual social and material impacts of scientific metaphors in colonial contexts.⁴⁹ Taken together, they suggest that engaging Indigenous terms of comparison and reference in these contexts will necessarily change the relationship between science and society.

Metonymy: Telling Non-Reductive Stories

Metonymy is closely related to synecdoche in that it provides a handle to grasp when confronting a large, complex idea or problem. But where synecdoche provides a part of the whole to grasp, metonymy offers an association—a linked symbol or emblem in place of the subject at hand.⁵⁰ For example, “the Crown” serves as a handy metonym for the tangled genealogical and political history of the Windsors, and we say someone “took the badge” instead of narrating the complicated process by which they became a law enforcement officer. Importantly, stories themselves function metonymically, to explore philosophical concepts or teach social norms indirectly; these are our myths and morality tales. By linking events and concepts into associative configurations rather than reducing them to a few generative causes like “society” or “patriarchy,” metonymic narration offers a powerful alternative to traditional Euro-American scientific narratives, one that makes space for a diversity of voices. For this reason, feminist scholars of composition and technical communication have embraced metonymy.⁵¹ We have at least two strong examples of metonymic rhetorical invention in the volume.

Chapter 7, “This is a Viral Story about Viral Stories: Image and Graphical Power in COVID Communication in the Navajo Nation,” by Sunnie R. Clahchischiligi, Julianne Newmark, and Joseph Bartolotta, examines multimodal and media-rich ways of communicating about COVID-19 in Tuba City, Arizona, that foreground Diné (Navajo) traditions for understanding and talking about health and illness. The Navajo Nation achieved astounding rates of vaccination, nearly 80 percent, largely

through internal cultural messaging. In investigating this case, the authors embrace “storying” as an Indigenous rhetorical method that serves as a powerful and effective counterpoint to traditional technical communication. They consider a number of Indigenous media messages about COVID-19, first via a story by Clahchischiligi, a member of the Navajo Nation, and then afterward by traditional rhetorical analysis: the two accounts stand side-by-side and illuminate each other without insisting that inconsistencies or excesses be reconciled. This approach creates a richer account of technical communication in a vulnerable community than a traditional Euro-American analytical approach could create.

Finally, in chapter 8, “A Rhetoric of the Home Ground: Local Knowledge and Data-Gathering among the North Atlantic Glaciers,” Ryan Eichberger imagines another way to hybridize Euro-American and Indigenous sciences without reducing one to the other. Eichberger uses the Icelandic glacier as a lens through which to view not only the development of a specific Euro-American science—glaciology—but also a contemporaneous Indigenous tradition for understanding and living with glaciers. Early settlers recorded vivid verbal-visual impressions of the glaciers in classic works of Icelandic literature, such as *Egil’s Saga*, *Grettir’s Saga*, and the *Book of Settlements*. Then, beginning in the Enlightenment era, the Danish natural philosophers who indexed Iceland for purposes of colonial governance made their own technical drawings. Glaciers were visually appropriated by 20th and 21st century glaciology, which rendered them as satellite maps, thermal gradients, and ice-core strata; local photographers also made their own records of retreating glaciers. The glaciers thus exist in different ways for different communities at different times, and these visualizations sometimes clash as Icelanders decide how to live with their melting heritage. Eichberger attempts to set all these different glaciers side by side in his narrative, which both complicates our understanding of the development of Euro-American science in Iceland and suggests that paradigms pitting Euro-American sciences against Indigenous knowledges will be insufficient to frame moments of cultural contact and transition in vulnerable locations.

As should be apparent from the above synopsis, this volume on global rhetorics of science comprises a diverse array of contexts, methods, voices, and styles. Most of the scholars in this volume do not even identify as rhetoricians. Notwithstanding, all share a commitment to better understanding the relationship between world-building and community-building, and to contributing to the decolonization of scientific practice around

the world. As they engaged in this project of reconfiguring global rhetorics of science, they attempted to observe key principles set out by the comparative and decolonial rhetorical scholarship reviewed above. They wrote about communities in which they lived or belonged to whenever possible, and when this wasn't possible, they gave the community space to speak for itself, engaging rhetorics of listening from close readings of social media to interviews.⁵²

It is my hope that readers will come to our volume with an open mind. Some of our chapters do not sound like traditional academic arguments; some present ideas that may be uncomfortable or even shocking to ROS scholars. But I would argue that we cannot hope to diversify the "science" in "rhetoric of science" if we are not willing to change the way we understand and talk about science in the first place. The contributors to this volume help us take a first step on that path, and for that gift, as their editor, I am more grateful than I can say. I want to close this introduction by extending our work as an invitation to like-minded scholars to put their shoulders to the wheel of a more equitable and collaborative role for Euro-American science in the management of global risks. There is certainly no time like the present.

Notes

1. Leah Tonino, "Two Ways Of Knowing: Robin Wall Kimmerer On Scientific And Native American Views Of The Natural World," *Sun Magazine*, April 2016, <https://www.thesunmagazine.org/issues/484/two-ways-of-knowing>.

2. We have chosen to use the descriptor *Euro-American* for the current dominant global scientific tradition, instead of Western, to add more specificity to the descriptor and also to defuse the Orientalism resulting from West/East and Western/non-Western.

3. Steve Morton, Mandy Martin, Kim Mahood, and John Carty, eds., *Desert Lake: Art, Science and Stories from Paruku* (Collingwood, Australia: CSIRO, 2013), 23.

4. See, especially on "cosmic incommensurability," Randy Allen Harris, *Rhetoric and Incommensurability* (Chicago: Parlor Press, 2005).

5. Helaine Selin, *Encyclopaedia Of The History Of Science, Technology, and Medicine in Non-Western Cultures* (Berlin: Springer Science & Business Media, 2013) this is the key reference on global sciences; also see Paul Keyser, *The Oxford Handbook of Science and Medicine in the Classical World* (Oxford: Oxford University Press, 2018). On mathematics, see Ubiratan D'Ambrosio, *Mathematics across Cultures: The*

History of Non-Western Mathematics, vol. 2 (Berlin: Springer Science & Business Media, 2001). For a defense of the term *global science* as used in this volume (as opposed to *nonwestern science* and *ethnoscience*), see Sujit Sivasundaram, “Sciences and the global: on methods, questions, and theory,” *Isis* 101, no. 1 (2010): 146–58. For the impact of colonial imperialism on the development of Euro-American science, see G. Dawson B. V. Lightman, M. Elshakry, and S. Sivasundaram, *Victorian Science and Literature: Science, Race and Imperialism* (London: Pickering & Chatto, 2012). The special issue of *Isis* on global sciences (vol. 101) is excellent. Although “ethnoscience” is a contested term, much important work on global sciences has gone on under that heading: see in particular Stephan Rist and Farid Dahdouh-Guebas, “Ethnosciences—A Step Towards the Integration of Scientific and Indigenous Forms of Knowledge in the Management of Natural Resources for the Future,” *Environment, Development and Sustainability* 8, no. 4 (2006): 467–93; William C. Sturtevant, “Studies in Ethnoscience 1,” *American Anthropologist* 66, no. 3 (1964): 99–131. A complete list of literature on individual global sciences beyond what is contained in the reference listed above is infeasible, but for major and/or classical traditions: On African sciences, G. Emeagwali and G. J. S. Dei, *African Indigenous Knowledge and the Disciplines* (Rotterdam: SensePublishers, 2014). For Islamic science, see Osman Bakar, *Tawhid and Science: Essays on the History and Philosophy of Islamic Science* (Penang, Malaysia: Secretariat for Islamic Philosophy and Science, 1991); George Saliba, *Islamic Science and the Making of the European Renaissance* (Cambridge, MA: MIT Press, 2007). For science and mathematics in pre-Columbian American societies, see James J. Aimers and Prudence M. Rice, “Astronomy, Ritual, and the Interpretation of Maya ‘E-Group’ Architectural Assemblages,” *Ancient Mesoamerica* 17, no. 1 (2006): 79–96; Marcia Ascher and Robert Ascher, *Code of the Quipu: A Study in Media, Mathematics, and Culture* (Ann Arbor: University of Michigan Press, 1981); Francisco Guerra, “Aztec Science and Technology,” *History of Science* 8, no. 1 (1969): 32–52; Robin Wall Kimmerer, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants* (Minneapolis, MN: Milkweed Editions, 2013). The majority of solid work on Classical Chinese sciences has been published in Mandarin and Russian, but see the Science and Civilisation in China series from Cambridge University Press, and on Classical Chinese medicine, K. Chimin Wong and Lienteh Wu, *History of Chinese Medicine. Being a Chronicle of Medical Happenings in China from Ancient Times to the Present Period* (Tientsin: Tientsin Press, 1932).

6. Sivan Kartha, “Discourses of the Global South,” in *The Oxford Handbook of Climate Change and Society*, ed. John S. Dryzek, Richard B. Norgaard, and David Schlosberg (Oxford: Oxford University Press, 2011), 504–19; J. Martinez-Alier, *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation* (Cheltenham, UK: Edward Elgar Publishing, 2003). See both of these sources for general problems with climate justice in the Global South. For specific issues regarding scientific and technical communication, see the special volume of

Connexions on this topic, particularly Gerald Savage and Godwin Agboka, “Guest Editors’ Introduction to Special Issue,” *Professional Communication, Social Justice, and the Global South* (2016): 3.

7. Lynda Olman and Danielle DeVasto, “Hybrid Collectivity: Hacking Environmental Risk Visualization for the Anthropocene,” *Communication Design Quarterly* 8, no. 4 (2020): 18–28.

8. In this volume we will use the term *communication* not to refer to the narrow field of communication studies but to a shared human practice of building the world and community simultaneously via *symbolic action* as defined by Kenneth Burke, *Language as Symbolic Action: Essays on Life, Literature, and Method* (Berkeley: University of California Press, 1966). I include material and affectual circulation under symbolic action because the action of signs, things, and energy is manifestly joint and not worth untangling for our present purpose, which is to introduce the new field of global rhetorics of science. Further work will doubtless wish to untangle those modalities of communication in particular situations.

9. George A. Kennedy, *Aristotle on Rhetoric: A Theory of Civic Discourse: Translated with Introduction, Notes and Appendices* (Oxford: Oxford University Press, 2007), 37.

10. Yasmeen Mahnaz Faruqi, “Contributions of Islamic Scholars to the Scientific Enterprise,” *International Education Journal* 7, no. 4 (2006): 392-3.

11. Saliba, *Islamic Science*, 66.

12. Faruqi, “Contributions of Islamic Scholars,” 393–94; Saliba, *Islamic Science*, 193–4; El-Sayed El-Bushra and M. M. Muhammadain, “Perspectives on the Contribution of Arabs and Muslims to Geography,” *GeoJournal* 26, no. 2 (1992): 157–66.

13. Jim Al-Khalili, *The House of Wisdom: How Arabic Science Saved Ancient Knowledge and Gave Us the Renaissance* (London: Penguin, 2011).

14. See for instance Marwa S. Elshakry, “Knowledge in Motion: The Cultural Politics of Modern Science Translations in Arabic,” *Isis* 99, no. 4 (2008): 701–30; chapters 14 to 19 in Michael J. L. Young, John Derek Latham, and Robert Bertram Serjeant, *Religion, Learning and Science in the ‘Abbasid Period* (Cambridge: Cambridge University Press, 2006); and chapter 2 in Saliba, *Islamic Science*.

15. Patrick Kingsley, “Turkey Drops Evolution from Curriculum, Angering Secularists,” *New York Times*, April 23, 2017, <https://www.nytimes.com/2017/06/23/world/europe/turkey-evolution-high-school-curriculum.html>.

16. Seng Loo, “Islam, Science and Science Education: Conflict or Concord?,” *Studies in Science Education* 36 (2001): 45–77, <https://doi.org/10.1080/03057260108560167>; Suleman Dangor, “Islamization of Disciplines: Towards an Indigenous Educational System,” *Educational Philosophy and Theory* 37, no. 4 (2005): 519–31, <https://doi.org/10.1111/j.1469-5812.2005.00138.x>.

17. Eric Winkel, “Tawhw and Science: Essays on the History and Philosophy of Islamic Science, by Osman Bakar (Review),” *Muslim World LXXXIII*, no. 3–4 (1993): 329–35.

18. Bakar, *Tawhid and Science*, 1–2.
19. Kenneth Burke, *Language As Symbolic Action*; Chaim Perelman and Lucie Olbrechts-Tyteca, *The New Rhetoric* (Notre Dame, IN: Notre Dame University Press, 1971).
20. Ulrich Beck, Scott Lash, and Brian Wynne, *Risk Society: Towards a New Modernity*, (London: Sage, 1992).
21. G. Thomas Goodnight, “The Personal, Technical, and Public Spheres of Argument: A Speculative Inquiry into the Art of Public Deliberation,” *The Journal of the American Forensic Association* 18, no. 4 (1982): 215.
22. This work on networks and topologies in rhetoric has been inspired by the post-critical and spatial turns, particularly by the work of Gilles Deleuze, Félix Guattari, and Bruno Latour. For examples, see these edited volumes: Paul Lynch and Nathaniel Rivers, *Thinking with Bruno Latour in Rhetoric and Composition* (Carbondale, IL: SIU Press, 2015); Lynda Walsh and Casey Boyle, *Topologies as Techniques for a Post-Critical Rhetoric* (New York: Springer, 2017).
23. This work on materialist rhetorics has two major strands: Marxist and Heideggerian. A good example of a Marxist approach can be found in Kelly Happe’s chapter in this volume (chapter 5). A good example of a Heideggerian approach to materialist rhetorics is Thomas Rickert, *Ambient Rhetoric: The Attunements of Rhetorical Being* (Pittsburgh, PA: University of Pittsburgh Press, 2013).
24. LuMing Mao, “Doing Comparative Rhetoric Responsibly,” *Rhetoric Society Quarterly* 41, no. 1 (2011): 64–69. See also Scott R. Stroud, “Pragmatism and the Methodology of Comparative Rhetoric,” *Rhetoric Society Quarterly* 39, no. 4 (2009): 353–79; Bo Wang, “Comparative Rhetoric, Postcolonial Studies, and Transnational Feminisms: A Geopolitical Approach,” *Rhetoric Society Quarterly* 43, no. 3 (2013): 226–42.
25. On contact zones see Mary Louise Pratt, “Arts of the Contact Zone,” *Profession* (1991), <http://www.jstor.org/stable/25595469>. For works setting out the terms of decolonial studies of rhetoric in general, see Lisa Flores, “Advancing a Decolonial Rhetoric,” *Advances in the History of Rhetoric* 21, no. 3 (2018): 320–22; Romeo García and Damián Baca, “Rhetorics Elsewhere and Otherwise: Contested Modernities, Decolonial Visions” (Champaign, IL: NCTE, 2019); Amardo Rodriguez, “A New Rhetoric for a Decolonial World,” *Postcolonial Studies* 20, no. 2 (2017): 176–86. For a critical/decolonial collection of American rhetorics, see Damián Baca and Victor Villanueva, eds., *Rhetorics of the Americas: 3114 BCE to 2012 CE* (New York: Palgrave Macmillan, 2010).
26. Malea Powell, “Rhetorics of Survivance: How American Indians Use Writing,” *College Composition and Communication* 53, no. 3 (2002): 398.
27. Ellen Cushman, “Translingual and Decolonial Approaches to Meaning Making,” *College English* 78, no. 3 (2016): 236.
28. Lisa King, Rose Gubele, and Joyce Rain Anderson, *Survivance, Sovereignty, and Story: Teaching American Indian Rhetorics* (Boulder: University Press of Colorado, 2015), 4.

29. Randy Allen Harris, *Landmark Essays on Rhetoric of Science Case Studies* (Mahwah, NJ: Lawrence Erlbaum Associates, 1997). See this source for a good sample of first-wave ROS studies. For the critical turn in ROS, see Alan G. Gross and William M. Keith, *Rhetorical hermeneutics: Invention and interpretation in the age of science* (Albany, NY: SUNY Press, 1997).

30. On intersectional issues around race, class, and gender in ROS see Celeste M. Condit, “How the Public Understands Genetics: Non-Deterministic and Non-Discriminatory Interpretations of the “Blueprint” Metaphor,” *Public Understanding of Science* 8, no. 3 (1999): 169–80, <https://doi.org/10.1088/0963-6625/8/3/302>; Kelly E Happe, *The Material Gene: Gender, Race, and Heredity After the Human Genome Project* (New York: NYU Press, 2013); Lisa Keränen, *Scientific Characters: Rhetoric, Politics, and Trust in Breast Cancer Research* (University of Alabama Press, 2010); James Wynn, *Citizen Science in the Digital Age: Rhetoric, Science, and Public Engagement* (Tuscaloosa: University of Alabama Press, 2017). On disability in ROS see Jordynn Jack, *Autism and Gender: From Refrigerator Mothers to Computer Geeks* (Champaign: University of Illinois Press, 2014); Jenell Johnson, *American Lobotomy: A Rhetorical History* (Ann Arbor: University of Michigan Press, 2014). On nonhuman agency and posthumanism see S. Scott Graham, *The Politics of Pain Medicine: A Rhetorical-Ontological Inquiry* (Chicago: University of Chicago Press, 2015); Kristen R. Moore and Daniel P. Richards, *Posthuman Praxis In Technical Communication* (New York: Routledge, 2018).

31. Selin, *Encyclopaedia*.

32. Miriam F. Williams, “Reimagining NASA: A Cultural and Visual Analysis of the U.S. Space Program,” *Journal of Business and Technical Communication* 26, no. 3 (2012): 368–89.

33. Julianne Newmark, “The Formal Conventions of Colonial Medicine: Bureau of Indian Affairs’ Agency Physicians’ Reports, 1880–1910,” *College Composition and Communication* 71, no. 4 (2020): 620–42; Kenneth C. Walker, *Climate Politics on the Border: Environmental Justice Rhetorics* (Tuscaloosa: University of Alabama Press, 2022).

34. Godwin Y. Agboka, “Decolonial Methodologies: Social Justice Perspectives in Intercultural Technical Communication Research,” *Journal of Technical Writing and Communication* 44, no. 3 (2014): 297–327.

35. Angela M. Haas, “Race, Rhetoric, and Technology: A Case Study of Decolonial Technical Communication Theory, Methodology, and Pedagogy,” *Journal of Business and Technical Communication* 26, no. 3 (2012): 277–310. Also, see the special issue of the *Journal of Business and Technical Communication* (24, no. 4) and Cana U. Itchuaqiyaq’s *Decolonial Methods in TPC: FULL Undergrad Course* (2020), <https://www.itchuaqiyaq.com/post/decolonial-methods-in-tpc-full-undergrad-course>.

36. Henry Etzkowitz and Loet Leydesdorff, “The Dynamics of Innovation: From National Systems and ‘Mode 2’ to a Triple Helix Of University–Industry–Government Relations,” *Research Policy* 29, no. 2 (2000): 109–23.